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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/505,695	02/17/2000	Ivan Berry	0932/00381	6935

7590 11/18/2002
Epstein, Edell, Shapiro, Finnan & Lytle, LLC
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Rockville, MD 20850

EXAMINER

LE, THAO X

ART UNIT	PAPER NUMBER
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2814

DATE MAILED: 11/18/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/505,695

Applicant(s)

BERRY ET AL.

Examiner

Thao X Le

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 23 September 2002.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 2-11 and 13-23 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 2-11 and 13-23 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ 6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 2-6, 9-11, 14, 16-21 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 6,242,165 to Vaartstra, and further in view of US Patent 5068040 to Jackson.

Regarding to claims 20, Vaartstra teaches the method of enabling the removal of fluorine containing residue, column 6 line 49, from a semiconductor substrate 12, fig. 1, comprising the steps of: applying a gas and /or vapor to which the residue is reactive to the residue while the temperature of the substrate is at an elevated level, column 7 line 55-56, with respect to ambient temperature for a time period, column 8 line 50, which is sufficient to effect at least one of volatilizing the residue, column 5 line 7-9.

But Vaartstra does not expressly teach the residue is exposed to the ultraviolet (UV) radiation simultaneously with gas/or vapor.

However, Jackson's reference discloses the residue is exposed to the UV radiation simultaneously with gas/or vapor, column 4 line 5, 59-65, and column 5 line 53. At the time of the invention was made; it would have been obvious to one of ordinary skill in the art to combine the UV radiation simultaneously with ammonia teaching of Jackson

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with Vaartstra, because it would have improved in the effectiveness of the cleaning process as taught by Jackson, column 6 line 1-3.

Regarding to claims 4, 21 and 23, Vaartstra does not expressly teach the method wherein a UV lamp provides the UV radiation and the residue is exposed to the ultraviolet radiation by blanketing the residue with UV radiation.

But Jackson's reference discloses the method wherein the UV radiation is provided by a UV lamp, column 5 line 55, and the residue is exposed to the ultraviolet radiation by blanketing the residue with UV radiation, column 4 line 5. At the time of the invention was made; it would have been obvious to one of ordinary skill in the art to combine the exposing the residue to UV radiation teaching of Jackson with Vaartstra, because it would have improved in the effectiveness of the cleaning process as taught by Jackson, column 6 line 1-3.

With respect to the UV lamp, such UV lamp is typical and commercially available as discloses by Jackson, column 5 lines 54-55.

Regarding to claim 2, 3, 6, 9, 10, 11, 14, 16, 17, 18, 19, Vaartstra discloses the method wherein the gas is comprised of ammonia is mixed with nitrogen, column 5 line 54-58, and the gas is applied at a pressure at about one atmosphere, column 8 line 5.

Regarding to claim 5, Vaartstra teaches the method wherein before the gas is applied, an ashing process is performed on the photoresist, column 6 line 65.

3. Claims 7, 8, 13, 15 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 6,242,165 to Vaartstra, and further in view of US Patent 5068040 to Jackson as

applied to claim 20 above, and further in view of Silicon Processing for the VLSI Era Volume 1 by S. Wolf and R.N. Tauber.

Regarding to claims 7, 8, 13, and 15, Vaartstra does not expressly teach the substrate is rinsed with deionized (DI) water. However, the substrate is rinsed with DI water after dry etching is well know in the art, see Silicon Processing for the VLSI Era Volume 1 by S. Wolf and R.N. Tauber, page 514-517

Regarding to claim 22, Vaartstra discloses a method of processing in Fig. 1 a semiconductor wafer comprising the steps of: coating the wafer with photoresist 16, imaging a patterned on the photoresist, column 6 line 64, forming integrated circuit component on the wafer, column 7 line 10, and removing the photoresist from the wafer by

- a) performing an ashing process on the photoresist which removes the photoresist except for a residue, column 6 line 63-67, and
- b) removing the residue by applying a ammonia gas to the residue while the temperature of the substrate is at an elevated level, column 7 line 55-56, with respect to ambient temperature for a time period, column 8 line 50, which is sufficient to effect at least one of volatilizing the residue, column 5 line 7-9.

However, Vaartstra does not expressly teach imaging a pattern on the photoresist with ultraviolet radiation, developing the photoresist, hardbaking or stabilizing the photoresist, and the residue is exposed to the UV radiation simultaneous with gas/or vapor.

With respect to imaging a pattern on the photoresist with ultraviolet radiation, developing the photoresist, and hardbaking or stabilizing the photoresist are well know

process in the art and they are being published in the Silicon Processing for the VLSI Era Volume 1 by S. Wolf and R.N. Tauber, Chapter 12, see page 429 Fig. 14, pages 434, and 452-453

But, Jackson's reference discloses the residue is exposed to the UV radiation simultaneously with gas/or vapor, column 4 line 5, 59-65, and column 5 line 53. At the time of the invention was made; it would have been obvious to one of ordinary skill in the art to combine the UV radiation simultaneously with ammonia teaching of Jackson with Vaartstra's method, because it would have improved in the effectiveness of the cleaning process as taught by Jackson, column 6 line 1-3.

Response to Arguments

4. Applicant's arguments filed 09/23/02 have been fully considered but they are not persuasive. The Applicant argues that Vaartstra's fluid does not react the residue. The process is simply one of solvation. The Examiner respectfully disagrees because such solvating process would constitute a chemical reaction between residues with ammonia in order to remove such residues from the substrate.

Conclusion

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

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A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Thao X Le whose telephone number is 703-306-0208. The examiner can normally be reached on M-F from 8:00 AM - 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Wael M Fahmy can be reached on 703-308-4918. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

Thao X. Le
November 14, 2002


PHAT X. CAO
PRIMARY EXAMINER